A Higher Level of Performance

Data Sheet

Sultan

Acoustic Wave Series

Level, Flow, Positioning, Collision Protection

For more information, please visit >
www.hawkmeasure.com

Overview

Sultan Acoustic Wave Series

Principle of Operation

The SULTAN 234 emits a high powered Acoustic Wave transmit pulse which is reflected from the surface of the material being measured. The reflected signal is processed using specially developed software to enhance the correct signal and reject false or spurious echoes.

The transmission of high powered Acoustic Waves ensures minimal losses through the environment where the sensor is located. Due to the high powered emitted pulse, any losses have far less effect than would be experienced by traditional ultrasonic devices. More energy is transmitted hence more energy is returned. Advanced receiver circuitry is designed to identify and monitor low level return signals even when noise levels are high. The measured signal is temperature compensated to provide maximum accuracy to the outputs and display.

Function

The Sultan 234 is a non intrusive Acoustic Wave transmitter with flexibility, used for measuring level of liquids, slurries and solids.

Universal Supply

- 2 Wire Loop Powered
- 3 Wire DC
- 4 Wire AC / DC.

Certifications

ATEX, SAA / IECEx, CE, CSA.

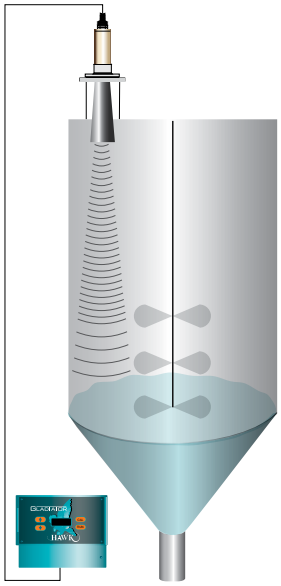
Primary Areas of Application

- Dirty / dusty / build up prone applications
- Self Cleaning sensor face requires no maintenance.
- **Water / Wastewater:**
  River Level, Wet Wells, Inlet Screens, Tanks, Sumps, Pump Stations, Water Towers, Dams, Basin Levels, Chemical Storage.
- **Mining:**
  Crushers, Surge Bins, Ore Passes, Conveyor Profile, Blocked Chute, Stockpile, Stackers, Reclaimers, Storage Silos, etc.
- **Power Stations:**
  Boiler Bunkers, Raw Coal Bunkers, Ash Pits, Fly Ash Silos, etc.
- **Others:**
  Food, Cement, Plastics, Grain, Chemicals, Paper, Irrigation, Quarries.

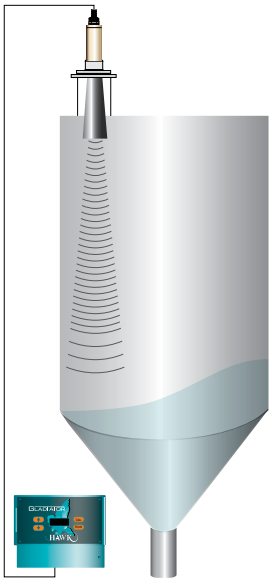
Features

- Non contact measurement
- High Power even with two wire loop supply
- Low cost per point
- Wide range of communications:
  DeviceNet, GosHawk, HART, Modbus, Profibus DP, Foundation Fieldbus & Profibus PA
- Pump Control x5 pumps
- Auto compensation for dust, steam and losses
- Protection class IP67, NEMA 4x (IP68 Transducer)
- Programmable fail safe mode
- 3G remote setup options / configuration
- Differential and average level control (2 transducers).

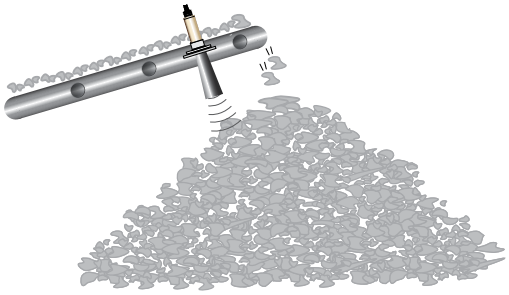
Conical Shape Vessels



Horizontal Cylindrical / Tanks



Stockpiles, Stackers, Reclaimers



Solids Vessels

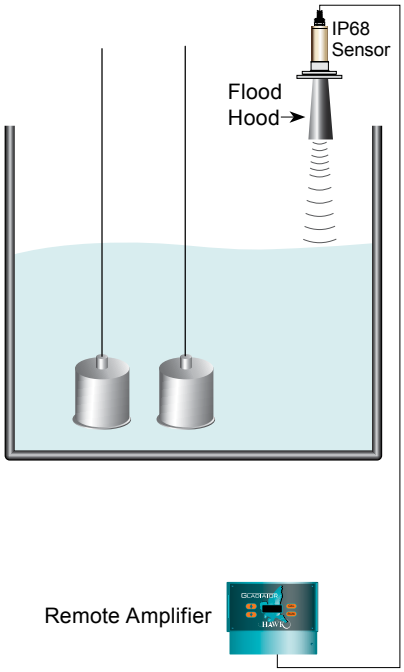
High / Low / Continuous level
(Granular / Powder)

Storage Tanks

High / Low / Continuous level
(Liquid / Chemical)

Sewage Wet Well

High / Low / Continuous level
Up to 5 Pumps

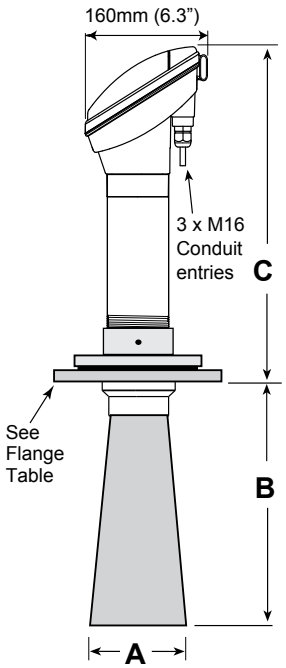


Dimensions

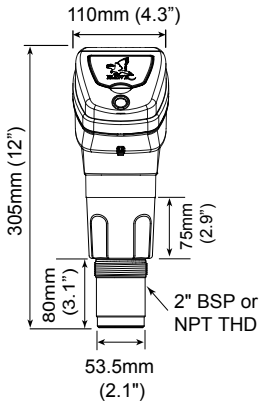
Sultan Acoustic Wave Series

Integral Units

Standard Type

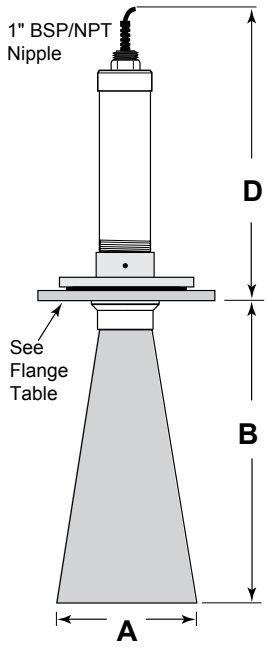


Compact Type (2"BSP / NPT)

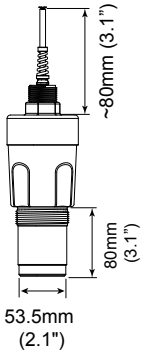


Remote Transducers

Standard Type



Compact Type (2"BSP / NPT)

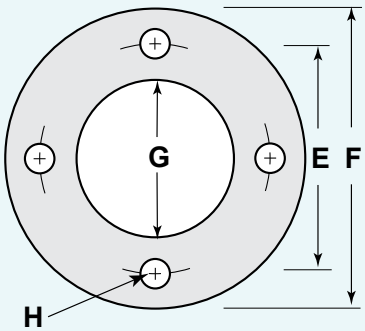


All cones must protrude into the main volume of the vessel by at least 50 mm (2 inches) past the lower end of the mounting nozzle.

Cone / Transducer Dimensions Table

Sensor Frequency	Selected Flange	A		B		C		D	
		mm	in.	mm	in.	mm	in.	mm	in.
5 kHz	10"	236	10.0	455	17.9	840	33.1	750	29.5
10 kHz	10"	236	10.0	455	17.9	540	21.3	450	17.7
	8"	195	8.0	280	11.1	540	21.3	450	17.7
15 kHz	10"	236	10.0	455	17.9	440	17.3	350	13.8
	8"	195	8.0	280	11.0	440	17.3	350	13.8
20 / 30 kHz	4"	98.5	4.0	280	11.0	390	15.4	300	11.8
30 / 40 / 50 kHz	4"	98.5	4.0	280	11.0	350	3.8	260	10.2

Flanges



FLANGE TYPE:
A = ANSI Flange
J = JIS Flange
D = DIN Flange

Standard ANSI/DIN/JIS Flange Dimensions

Size	Flange Type	E (PCD)		F (OD)		G (ID)		H (Hole)		No. Holes
		mm	in.	mm	in.	mm	in.	mm	in.	
4"	FA4 ANSI class 150	190.5	7.5	229	9.0	100	4	19	0.75	8
	FD4 DIN100 PN10/16	180	7.1	220	8.7	100	4	18	0.71	8
	FJ4 JIS B2220-1984 10kg	175	6.9	210	8.4	100	4	19	0.75	8
6"	FA6 ANSI class 150	241.5	9.5	279	11.0	150	6	22	0.87	8
	FD6 DIN150 PN10	240	9.4	285	11.2	150	6	23	0.91	8
	FJ6 JIS B2220-1984 10kg	240	9.4	280	11.0	150	6	23	0.91	8
8"	FA8 ANSI class 150	298.5	11.8	343	13.5	200	8	22	0.85	8
	FD8 DIN200 PN10	295	11.6	340	13.4	200	8	22	0.85	8
	FJ8 JIS B2220-1984 10kg	290	11.4	330	13.0	200	8	19	0.91	12
10"	FA10 ANSI class 150	362	14.3	406	16.0	250	10	25	1.02	12
	FD10 DIN200 PN10	350	13.7	395	16.0	250	10	23	0.85	12
	FJ10 JIS B2220-1984 10kg	355	14.0	400	15.7	250	10	25	0.99	12

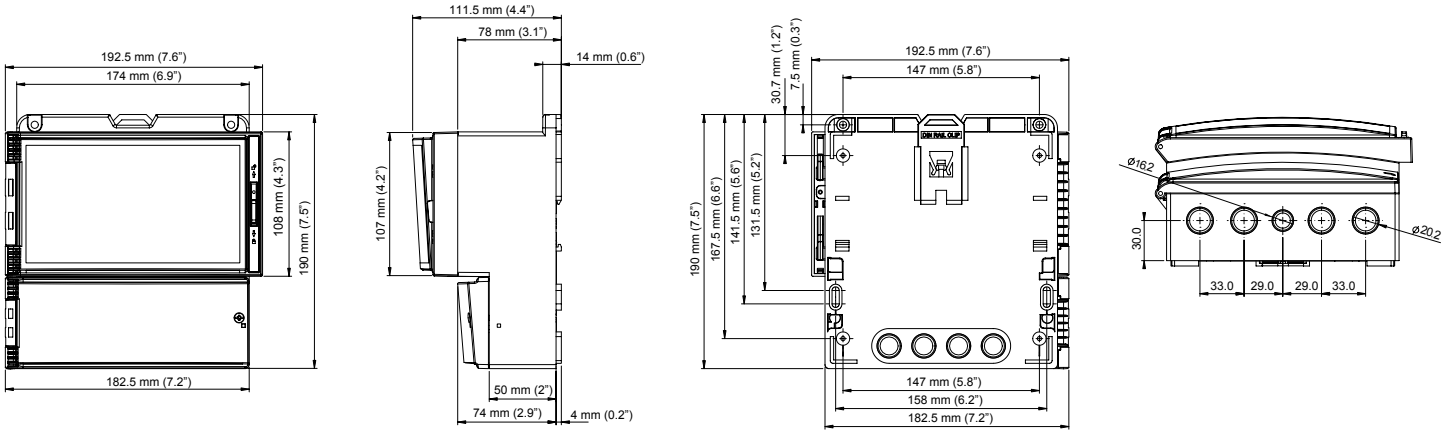
Dimensions & Wiring Diagrams

Sultan Acoustic Wave Series

Transducer / Cone / Flange Combinations			
Transducer	**Cone**	**Flange Option 1**	**Flange Option 2**
50 / 40kHz	C02	FA3	FA4
30kHz (T6)	C02	FA3	FA4
30kHz (T4)	C03	FA4A	FA6A
	C04	FA4A	FA6A
20kHz	C03	FA4A	FA6A
	C04	FA4A	FA6A
15kHz	C04	FA4A	FA6A
	C08	FA8A	FA10A
	C10	FA8A	FA10A
9 / 10kHz	C08	FA8A	FA10A
	C10	FA8A	FA10A
4 / 5kHz	C08	FA8A	FA10A
	C10	FA8A	FA10A

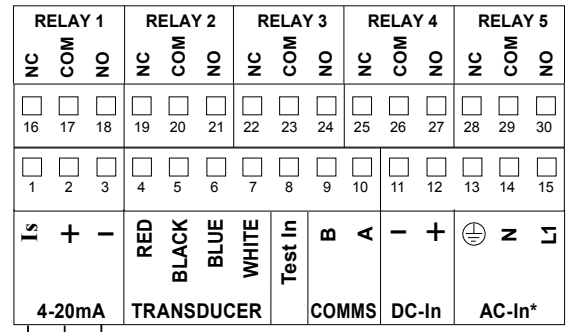
Not Recommended

Remote Amplifier



AWR Remote Transmitter

AWR234



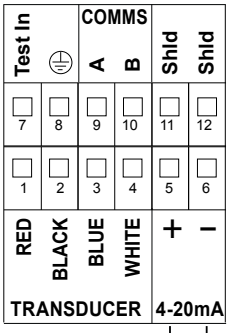
Sinking 4-20mA from user device

OR

Sourcing 4-20mA from Sultan

*48VDC Sultan version will have these terminals marked as the 30-48VDC input

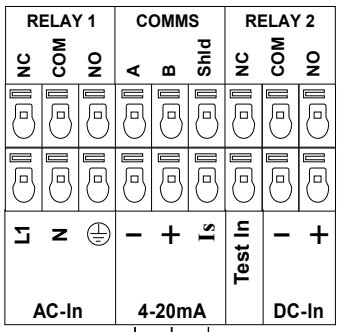
AWR2



Sinking 4-20mA from user device

AWI Integral Transmitter

AWI234

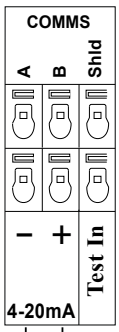


Sinking 4-20mA from user device

OR

Sourcing 4-20mA from Sultan

AWI2



Sinking 4-20mA from user device

Sultan Remote Transmitter

Model

AWR2 Remote 2 Wire, No relays, 12-30VDC only, Modbus

AWR234 Remote 2 / 3 / 4 Wire, 5 relays, Modbus

Housing

S Polycarbonate

Power Supply

B 12-30VDC

C 30-48VDC and 48-90VAC (234 units only)

U 12-30VDC and 90-260VAC (234 units only)

Additional Communications (PC comms GosHawk standard)

S Switch only. 5 relays (AWR234 only)

X 4-20mA analogue

H 4-20mA analogue with HART 2 wire (AWR2 only)

I 4-20mA analogue with HART Isolated 4 wire (AWR234 only)

A Profibus PA

P Profibus DP (AWR234 only)

F Foundation Fieldbus

D Devicenet (AWR234 only)

Internal HAWKLink Modem (not available)

X Not Required

Approval Standard

X Not Required

i0 (AWR2 only) IECEx Zone 0 Ex ia IIA T4 IP67 Tamb -20°C to 70°C

A0 (AWR2 only) ATEX Grp II Cat 1 GD IP67 EEx ia IIA T4

A22 ATEX Grp II Cat 3 GD T85°C IP67 Tamb -40°C to 70°C

GP CSA Equip Class 2; Pollution deg 2; Tamb -20°C to 75°C (Ordinary Locations)

RN CSA Class I; Div 1/2; Group D; Zone 0; AEx / Ex ia IIA; T4

KN CSA Class Ii; Div 2; Group F & G; Class III

Position Slave / Crane Master (Sultan 234 only)

X Not Required

PS Position Slave

CM Crane Master

AWR234	S	U	X	X	X	X

Sultan Remote Transducer 3” and 3.5”

Model

AWRT Acoustic Wave Remote Transducer

Transducer Frequency

- 30 30kHz for applications up to 15m for 3” (4” cone required)
- 20 20kHz for applications up to 20m, 3” only (4” cone is required)
- 15 15kHz for applications up to 30m, 3” only (8 / 10” cone is required)
- 10 10kHz for applications up to 40m, 3.5” only (10” cone is required)
- 09 09kHz for high power extended range up to 180m (10” cone is required)
- 05 05kHz for applications up to 60m, 3.5” only (10” cone is required), (Polyolefin face only)
- 04 04kHz for high power extended range up to 180m (10” cone is required), (Polyolefin face only)

Process Temperature - Facing material selection

- S Polyolefin 80°C (176°F) for 4, 5, 9 and 10kHz only
- T Teflon 80°C (176°F) 10, 15, 20, 30kHz only
- Y Titanium 80°C (176°F) 15kHz only

Transducer Housing Material

- 4 Polypropylene

End Cap Mounting Thread Standards

- X Not Required (Standard Flange Mount)
- TB BSP
- TN NPT

End Cap Mounting Thread Sizes

- X Not Required (Standard Flange Mount)
- 30 3” for 30, 20, 15 kHz
- 50 3.5” for 10, 9, 5 and 4kHz

Approval Standard

- X Not Required
- i0 IECEx Zone 0 Ex ia IIA T4 IP67 Tamb -20°C to 70°C
- A0 ATEX Grp II Cat 1 GD IP67 EEx ia IIA T4
- i1 IECEx Zone 1 Ex mb II IP68 T5(Tamb -20°C to 65°C) T6(Tamb -20°C to 50°C)
- A1 ATEX Grp II Cat 2 GD EEx m II IP68 T5(Tamb -20°C to 65°C) T6(Tamb -20°C to 50°C)
- i20 IECEx Zone 20 DIP A20 TA85C IP68 Tamb -20°C to 75°C
- A20 ATEX Grp II Cat 1 D T85°C IP67 Tamb -20°C to 75°C
- A22 ATEX Dust (Grp II Cat 3 D T85C IP67)
- GP CSA Equip Class 2; Pollution deg 2; Tamb -20°C to 75°C (Ordinary Locations)
- RN CSA Class I; Div 1/2; Group D; Zone 0; AEx / Ex ia IIA; T4
- KN CSA Class II; Div 2; Group F&G; Class III; T6 T85 for Tamb -20°C to 75°C
- QN CSA Class II; Div 1; Group E, F&G; Ex mb II; T5(T100) for Tamb -20°C to 65°C; T6(T85) for Tamb -20°C to 50°C

Connection

- C IP68 Sealed unit with cable

Cable Length

- 6 6m cable
- 15 15m cable
- 30 30m cable
- 50 50m cable

Mounting Accessories

- X Not Required
- CS End Cap Cable Suspension 30 / 20kHz only

Software Options

- X Not Required
- FP Fast Pulsing for 20 / 30kHz only
- PS Position Slave (Requires Position Slave Amplifier)

AWRT	10	T	4	X	X	X	C	6	X	X

Sultan Remote Transducer 2”

Model

AWRT Acoustic Wave Remote Transducer

Transducer Frequency

50 50kHz for liquid applications up to 5m
40 40kHz for liquid applications up to 7m
30 30kHz for liquid applications up to 11m

Process Temperature - Facing material selection

T Tefzel 80°C (176°F)

Transducer Housing Material

6 Tefzel

Thread Standard

TB BSP
TN NPT

Thread Size

20 2” thread

Approval Standard

X Not Required
i0 IECEx Zone 0 Ex ia IIA T4 IP67 Tamb -20°C to 70°C
A0 ATEX Grp II Cat 1 GD IP67 EEx ia IIA T4
i1 IECEx Zone 1 Ex mb II IP68 T5(Tamb -20°C to 65°C) T6(Tamb -20°C to 50°C)
A1 ATEX Grp II Cat 2 GD EEx m II IP68 T5(Tamb -20°C to 65°C) T6 (Tamb -20°C to 50°C)
i20 IECEx Zone 20 DIP A20 TA85C IP68 Tamb -20°C to 75°C
A20 ATEX Grp II Cat 1 D T85°C IP67 Tamb -20°C to 75°C
A22 ATEX Grp II Cat 3 GD T85°C IP67 Tamb -40°C to 70°C
GP CSA Equip Class 2; Pollution deg 2; Tamb -20°C to 75°C (Ordinary Locations)
RN CSA Class I; Div 1/2; Group D; Zone 0; AEx/Ex ia IIA; T4
KN CSA Class II; Div 2; Group F&G; Class III; T6 T85 for Tamb -20°C to 75°C
QN CSA Class II; Div 1; Group E, F&G; Ex mb II; T5(T100) for Tamb -20°C to 65°C; T6(T85) for Tamb -20°C to 50°C

Connection

C IP68 Sealed unit with cable

Cable Length

6 6m cable
15 15m cable
30 30m cable
50 50m cable

Mounting Accessories

X Not Required
CS Cable Suspension on end cap

Software Options

X Not Required

AWRT	30	T	6	TB	20	X	C	6	X	X

Sultan Integral 3” and 3.5”

Model

AWI2 Integral 2 Wire, No relays, Modbus

AWI234 Integral 2 / 3 / 4 Wire, 2 relays, Modbus

Housing

S Valox 357U

Power Supply

B 12-30 VDC

C 30-48VDC and 48-90VAC (234 units only)

U 12-30VDC and 90-260VAC (234 units only)

Transducer Frequency

30 30kHz for applications up to 11m for 2” and 15m for 3” (4” cone required)

20 20kHz for applications up to 20m, available in 3” only (4” cone required)

15 15kHz for applications up to 30m, available in 3” only (10” cone required)

10 10kHz for applications up to 40m, available in 3.5” only (10” cone required)

09 09kHz for high power extended range applications up to 180m (10” cone required)

05 05kHz for applications up to 60m, available in 3.5” only (10” cone required)

04 04kHz for high power extended range applications up to 180m (10” cone required)

Process Temperature - Facing material selection

S Polyolefin 80°C (176°F) for 4, 5, 9 and 10kHz only

T Teflon 80°C (176°F) 10, 15, 20, 30kHz only

Y Titanium 80°C (176°F) 15kHz only

Transducer Housing Material

4 Polypropylene

End Cap Mounting Thread Standard

X Not Required (Standard Flange Mount, see flange & cone selection)

End Cap Mounting Thread Sizes

X Not Required (Standard Flange Mount)

30 3” for 30, 20, 15 kHz

50 3.5” for 10, 9, 5 and 4kHz

Additional Communication

S Switch only. 2 relays (AWI234 only)

X 4-20mA analogue

H 4-20mA analogue with HART 2 wire (AWI2 only)

I 4-20mA analogue with HART Isolated 4 wire (AWI234 only)

A Profibus PA

F Foundation Fieldbus

Approval Standard

X Not Required

i0 (AWI2 only) IECEx Zone 0 Ex ia IIA T4 IP67 Tamb -20°C to 70°

A0 (AWI2 only) ATEX Grp II Cat 1 GD IP67 EEx ia IIA T4

i20 IECEx Zone 20 DIP A20 TA85C IP68 Tamb -20°C to 75°C

A20 ATEX Grp II Cat 1 D T85°C IP67 Tamb -20°C to 75°C

A22 ATEX Grp II Cat 3 GD T85°C IP67 Tamb -40°C to 70°C

Software Options

X Not Required

AWI234	S	U	10	S	4	X	X	X	X	X

Sultan Integral 2”

Model

AWI2 Integral 2 Wire, No relays, 12-30VDC only, Modbus
AWI234 Integral 2 / 3 / 4 Wire, 2 relays, Modbus

Housing

S Valox 357U

Power Supply

B 12-30 VDC
C 30-48VDC and 48-90VAC (234 units only)
U 12-30VDC and 90-260VAC (234 units only)

Transducer Frequency

50 50kHz for liquid applications up to 5m
40 40kHz for liquid applications up to 7m
30 30kHz for liquid applications up to 11m

Process Temperature - Facing material selection

T Tefzel 80°C (176°F)

Transducer Housing Material

6 Tefzel

Thread Standards

TB BSP
TN NPT

Mounting Thread Sizes

20 2” thread

Additional Communication

S Switch only. 2 relays (AWI234 only)
X 4-20mA analogue
H 4-20mA analogue with HART 2 wire (AWI2 only)
I 4-20mA analogue with HART Isolated 4 wire (AWI234 only)
A Profibus PA
F Foundation Fieldbus

Approval Standard

X Not Required
i0 (AWI2 only) IECEx Zone 0 Ex ia IIA T4 IP67 Tamb -20°C to 70°C
A0 (AWI2 only) ATEX Grp II Cat 1 GD IP67 EEx ia IIA T4
i20 IECEx Zone 20 DIP A20 TA85C IP68 Tamb -20°C to 75°C
A20 ATEX Grp II Cat 1 D T85°C IP67 Tamb -20°C to 75°C
A22 ATEX Grp II Cat 3 GD T85°C IP67 Tamb -40°C to 70°C

Software Options

X Not Required

AWI234	S	U	40	T	6	TB	20	X	X	X

Flange Selection

F Flange

Dimension Standard

A ANSI
D DIN
J JIS

Flange Sizes

2N 2” NPT flange
(2” NPT transducer thread body mounted only)
2B 2” BSP flange
(2” BSP transducer thread body mounted only)
4 4” acoustically isolated flange
(fits 3” units & 2” units with cone)
6 6” acoustically isolated flange (fits 3” & 3.5” units)
8 8” acoustically isolated flange (fits 3” & 3.5” units)
10 10” acoustically isolated flange (fits 3” & 3.5” units)

Flange Mounting Position

A Cone Mounted (standard)
B Transducer Body Mounted
C Angled flange piece only

Flange Material

4 Polypropylene

F A 4 A - 4

Cone Selection

C Focaliser Cone

Cone Size-Matching Transducer

02N C04 cone for 2” NPT transducer
(fits FA4A-4 flange)
02B C04 cone for 2” BSP transducer
(fits FA4A-4 flange)
04 4” cone for 20kHz and 3” 30kHz transducers
08-15 8” cone for 15kHz
08-10 8” cone for 10kHz
10-15 10” cone for 15kHz
10-10 10” cone for 10kHz
10-09 10” cone for 9kHz
10-05 10” cone for 5kHz
10-04 10” cone for 4kHz

Cone Material

4 Polypropylene
7A Carbon Fibre. Comes attached to Carbon Fibre ANSI Flange
7D Carbon Fibre. Comes attached to Carbon Fibre DIN Flange
7J Carbon Fibre. Comes attached to Carbon Fibre JIS Flange
8 Polyurethane

C 04 - 4

Special Cone

C03-4-Z OD72mm cone for 20kHz and 3” 30kHz

Accessories

HAWKLink Data Modem

Model

HLR Remote stand alone HAWKLink system

Power Supply

B 12-30VDC
U 12-30VDC and 90-260VAC

Network Type

G3 3G Autoband

Sim Card

S3 Australian Sim Card expires after 3 month
S12 Australian Sim Card expires after 12 month
X Not Required

HLR U G3 S3

HAWKLink USB PC connector for GosHawkII
HAWKLink-USB

Stainless Steel Sunhood
SUNHOOD

Junction Box for twin Transducer applications
AWRT-JB-01
AWRT-JB-06 (includes 6m cable)

Extra Cable (Belden 3084A)

CA-TXCC-R-C15 15m cable
CA-TXCC-R-C30 30m cable
CA-TXCC-R-C50 50m cable
CA-TXCC-R-C100 100m cable

Specifications

Sultan Acoustic Wave Series

Frequency

- 4kHz, 5kHz, 9kHz, 10kHz, 15kHz, 20kHz, 30kHz, 40kHz, 50kHz (4kHz & 9kHz are special long range versions).

Operating Voltage

- 12 - 30Vdc (residual ripple no greater than 100mV)
- 90 - 265Vac 50 / 60Hz
- 48Vdc, 48Vac-90Vac 50 / 60Hz.

Power Consumption

- <3W @ 24Vdc
- <10VA @ 240Vac
- <4W @ 48Vdc, <7VA @ 48Vac – 90Vac.

Analogue Output

- 4 -20mA
- Recommended 250 ohms with 24Vdc supply, max. 750 ohms.

Communications

- GosHawk, HART, Modbus, Profibus PA, Profibus DP, DeviceNet, Foundation Fieldbus
- Mulitidrop mode can address 1 -250 units over 4 wires.

Relay Output: (2) Integral (5) Remote

- Form 'C' (SPDT) contacts, rated 0.5A at 240Vac non-inductive
- All relays have independently adjustable dead bands
- Remote failsafe test facility for one relay.

Blanking Distance

- 50kHz = 0.25 m (10")
- 40kHz = 0.30 m (12")
- 30kHz = 0.35 m (14")
- 20kHz = 0.45 m (17")
- 15kHz = 0.60 m (24")
- 10 / 9kHz = 1.0 m (39")
- 5 / 4kHz = 1.5 m (59")

Maximum Range

5 m (16ft)	50kHz	liquids
7 m (22ft)	40kHz	liquids
11 m (33ft)	30kHz	liquids
20 m (65ft)	20kHz	liquids / slurries, 10m (33ft) solids
30 m (98ft)	15kHz	liquids / slurries, 20m (65ft) solids
40 m (165ft)	10kHz	liquids / slurries / powders / solids
60 m (196ft)	5kHz	liquids / slurries / powders / solids
180 m (588ft)	4 / 9kHz	for extended range

Resolution

- 1 mm (0.04") 50, 40, 30,20, 15, 10, 5kHz
- 4 mm (0.2") 9, 4kHz.

Sensor Accuracy (including Lineraity and Hysteresis)

- +/- 0.25% of measured range.

Operating Temperature

- Integral System -40°C (-40°F) to 80°C (176°F)
- Remote Electronics -40°C (-40°F) to 80°C (176°F)
- Remote Transducer -40°C (-40°F) to 80°C (176°F).

Transducer / Amplifier Separation

- Up to 1000m using specified extension cable.

Cable

- 4 conductor shielded twisted pair instrument cable
- Conductor size dependent on cable length
- BELDEN 3084A (max 500m), DEKORON IED183AA00

IMPORTANT
"USE SPECIFIED CABLE ONLY"

Maximum Operating Pressure

- +/- 7.5 PSI (+/- 0.5 Bar).

Beam Angle

7.5°	without focaliser	50kHz / 40kHz / 30kHz
4°	with focaliser	50kHz / 40kHz
6°	with focaliser	30kHz / 20kHz / 15kHz / 10kHz / 5kHz
10°	with focaliser	9kHz / 4kHz

Display

- 2 line x 12 digit alphanumeric LCD.

Memory

- Non-Volatile (No backup battery required)
- >10 years data retention.

Enclosure Sealing

- Integral System IP67
- Remote Electronics IP65 (Nema 4x)
- Remote Transducer IP68.

Cable Entries

- Integral: 3 x M16 Glands
- Remote: 3 x 20mm, 1 x 16mm knock outs.

Mounting

- ANSI, JIS or DIN Flange
- 4 in / 100mm to 10 in / 250mm
- 2in BSP Thread / NPT Thread.

Typical Weight

Sultan System with appropriate flange and cone

Frequency	kg	lb
4 or 5kHz Transducer	13	28.6
9 or 10kHz Transducer	10	22.0
15kHz Transducer	8	17.6
20 or 30kHz (3") Transducer	3	6.6
30, 40 or 50kHz (2") Transducer	1	2.2

Configuration	kg	lb
Remote Amplifier with 6m cable	1	2.2
Remote Amplifier with 15m cable	3	6.6
Remote Amplifier with 30m cable	6	13.2
Remote Amplifier with 50m cable	10	22.0

Span & Zero Facility

- Programmable

False Signal Tolerance

- Automatic signal control
- Programmable false signal mapping

Self Diagnostics

- Programmable Failsafe
- Measurement dignostics viewable on display

Attenuation

- Automatic temperatuer compensation
- Automatic signal recovery

Repeatability

- +/- 3mm

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Additional product warranty and application guarantees upon request.
Technical data subject to change without notice.